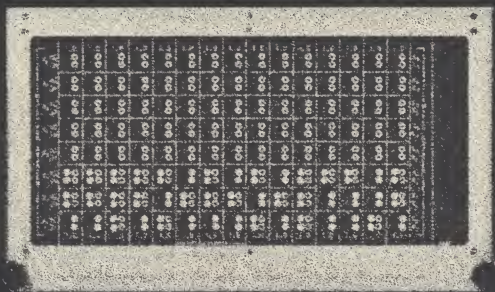
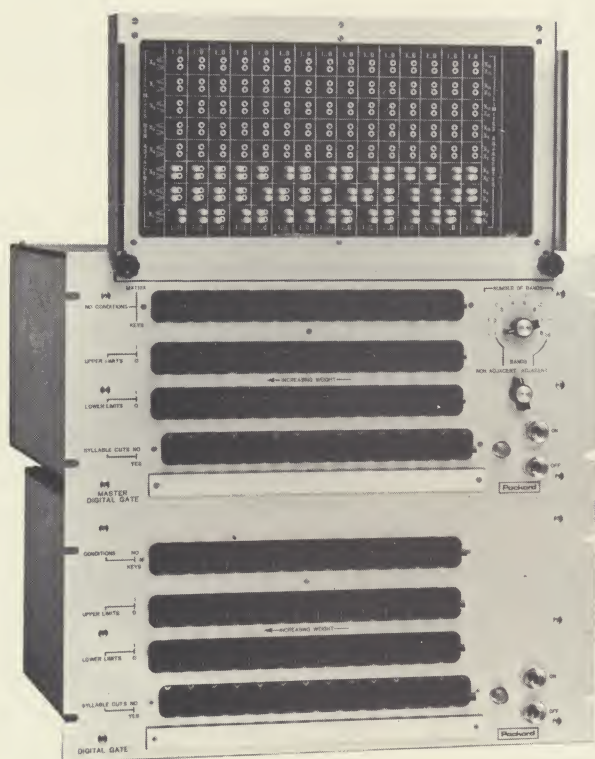


Packard

Models 122, 125, 127
Digital
Gate System

Bulletin 1087





General Description

The Model 122 Master Digital Gate, Model 125 Secondary Digital Gate, and Model 127 Digital Band Selector are elements of the Packard Multiparameter Analyzer System. Their role is analogous to that of a numerical filter whose output transmits only part of the information received at its input. This operation permits a selection of the data to be stored, classified and organized in other elements of the Packard Multiparameter Analyzer System while taking into account the data handling capacities of these elements.

In order to clarify the technical characteristics and specifications of the Digital Gate System the following definitions apply:

The output from a single detector producing an electric pulse is characterized by the following parameters:

- x:** represents the detector number of the particle ("geometric" variable)
- t:** its time of appearance ("time" variable)
- a:** its amplitude ("energy" variable)

The binary coding of a measurement results in many different stipulations and requires introduction of the definitions of the terms used below:

Bit: a single digital piece of information

Field: the total of all BITS characterizing the nuclear event studied: as in an N parameter FIELD

Word: the total of all BITS characterizing a *single* parameter: usually associated with each complete *x* or *t* or a binary number

Syllable: a digitally limited portion of either a WORD or FIELD: usually referred to the data output of the Digital Gates

Band: SYLLABLES derived from a single WORD in an N parameter FIELD

Region: SYLLABLES and/or WORDS derived from *more than one* parameter in an N parameter FIELD

Principles of Operation

The Digital Gate System makes it possible to select from the entire FIELD one or several WORDS and/or SYLLABLES for transmission to other elements in the Packard Multiparameter Analyzer System, usually to the associated Computer-Memories (Packard Models 25 and 45). Data transmission from the Digital Gate System takes place if and only if the WORDS comprising the FIELD of input information satisfy all the conditions posted on the Digital Gates at the same time.

For example, if we identify X, Y and Z as the 3 WORDS of a FIELD, the following three principal types of digital gating are possible:

- a:** transmit the two WORDS X and Y, providing the following requirements are met:

$$X_1 < X < X_2$$

$$Y_1 < Y < Y_2$$

$$Z_1 < Z < Z_2$$

where X_1, Y_1, Z_1 are lower limits
and X_2, Y_2, Z_2 are upper limits

- b:** transmit WORD Y if the following conditions are met:

$$Y_1 < Y < Y_2$$

$$X_1 < X < X_2 \text{ with } Y_3 < Y < Y_4$$

$$\text{or } Y_5 < Y < Y_6$$

Without any conditions on Z.

- c:** transmit the WORD X and the band number of the WORD Y if the following conditions are realized:

$$Y_1 < Y < Y_2 \text{ first band}$$

$$\text{or } Y_3 < Y < Y_4 \text{ second band}$$

$$\text{or } Y_5 < Y < Y_6 \text{ third band}$$

- d:** transmit REGIONS X, Y, Z if one of the following 3 limitations are realized:

$$X_1 < X < X_2 \quad X_3 < X < X_4 \quad X_5 < X < X_6$$

$$(1) Y_1 < Y < Y_2 \quad (2) Y_3 < Y < Y_4 \quad (3) Y_5 < Y < Y_6$$

$$Z_1 < Z < Z_2 \quad Z_3 < Z < Z_4 \quad Z_5 < Z < Z_6$$

The Digital Gate System is comprised of 3 main elements:

Model 122 Master Digital Gate

Model 127 Digital Band Selector

Model 125 Secondary Digital Gate

Model 122 alone permits the experimenter to

establish the digital gating control described in Example a: above.

The Model 122 when associated with the Model 127 permits digital gating on one or several BANDS indicated in Examples b: and c: above.

It is possible to associate 1, 2 or 3 Model 125 Secondary Digital Gates with the Model 122 Master Digital Gate. This association increases the input capacity from 15 bits (Model 122 alone) to a maximum of 57 bits (1 Model 122 and 3 Model 125). The Secondary Digital Gates can operate only in conjunction with the Master Digital Gates.

It is also possible to associate several Master Digital Gates and Digital Band Selectors with each other. This combination makes it possible to select several BANDS on several WORDS each of 15 bits maximum. This latter combination still permits one to place WORDS partly on one Model 122 and partly on a second Model 122. Finally, in an array containing N Model 122 Master Digital Gates and M ($M < N$) Model 127 Digital Band Selectors; as

many as 3N Model 125 Secondary Digital Gates (3 per Model 122) may be added.

The assemblies so organized act like one single Digital Gate System, with the determination of multiple BANDS taking place only on the Model 122's.

Digital gating may take place at either the outputs of the x and/or t, and/or a converters or at the output of the Packard Model 124 Computer Magnetic Tape Deck. The output of this gated information is directed to a Packard Computer-Memory, possibly through a Model 128 Digital Subtractor which permits optimum use of the Computer-Memory.

The setting of the upper and lower limits upon the WORDS is activated by means of lever switches in the case of one BAND per WORD, or by means of plug-in pins on the Model 127 in the case of N BANDS per WORD. Additional switches permit one to both eliminate all conditions on any WORD and to provide separation between individual WORDS.

Specifications—Models 122 and 125 Digital Gates

	Model 122	Model 125
Input Register		
Maximum Capacity	15 bits of information + 1 pilot bit	14 bits of information + 1 pilot bit
Code	pure parallel binary	pure parallel binary
Mode Switch		
"Conditions" lever switches	15 at 3 positions "Matrix" (Model 127) "Without Digital Control" "Keys"	14 at 2 positions "Without Digital Control" "Keys"
UPPER LIMIT lever switches (Pure binary control)	15 at 2 positions "0" "1"	14 at 2 positions "0" "1"
LOWER LIMIT lever switches (Pure binary control)	15 at 2 positions "0" "1"	14 at 2 positions "0" "1"
CUT-OFF lever switches	15 in 2 positions "yes" "no"	14 in 2 positions "yes" "no"
BAND switch	2 positions "adjacent" "non-adjacent"	
NUMBER OF BAND switch	8 positions "from 1 to 8 (non-adjacent bands) and 2 to 16" (adjacent bands)	
Output Signal	signal output providing indication of number of bands and conditions not achieved	
Dead Time		
Without Model 127	fixed = 13 μ s	controlled from Model 122
With Model 127 where N = number of bands used	maximum 38 μ s "non-adjacent" "adjacent"	 9 + 3.6 N ($1 < N < 8$) 9 + 1.8 N ($2 < N < 16$ with N even)

Specifications

Models 122 and 125 Digital Gates

Line Voltage

110-220 volts, 60 cycles

Operating Range

30°F to 120°F

Acceptable Equipment Combinations

The Model 125 must necessarily be associated with the Model 122; the format may be:

one Model 122 + one Model 125 = 29 bits

one Model 122 + two Model 125 = 43 bits

one Model 122 + three Model 125 = 57 bits

Model 127 Digital Band Selector

Gating Capacity:

15 columns which define the digital restrictions (0 and 1) of each bit directed to the Model 122. 16 lines of gating permitting 16 adjacent BAND control or 8 non-adjacent BAND control.

Manner of Selection:

By shorting pins

Physical Characteristics

The Digital Gates are completely transistorized units offered in standard rack mountable chassis and with a self-contained power supply.

Models 122 and 125:

length: 19"

height: 8 $\frac{3}{4}$ "

depth: 21"

weight: 55 lbs.

Model 127:

(Attaches to Model 122 Master Digital Gate)

length: 15"

height: 8"

depth: 2"

weight: 6 lbs.

Associated Equipment:

Packard Model 25—1024 Word Computer-Memory

Packard Model 45—4096 Word Computer-Memory

Packard Model 123—Buffer Organizer

Packard Model 124—Magnetic Tape System

Packard Model 126—Interconnection Matrices

The Packard logo consists of the word "Packard" in a bold, sans-serif font, enclosed within a rectangular border.

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